

Charging System: All Technical Service Bulletins

Starting & Charging - Systems Description/Diagnostics

Classification:

EL94-002

Reference:

NTB94-011

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STARTING & CHARGING SYSTEMS
GENERAL ELECTRICAL DIAGNOSIS

APPLIED VEHICLE(S):

All Models

SERVICE INFORMATION

The following bulletin provides a general description of the Starting and Charging systems, along with some service procedures for diagnosing system failures

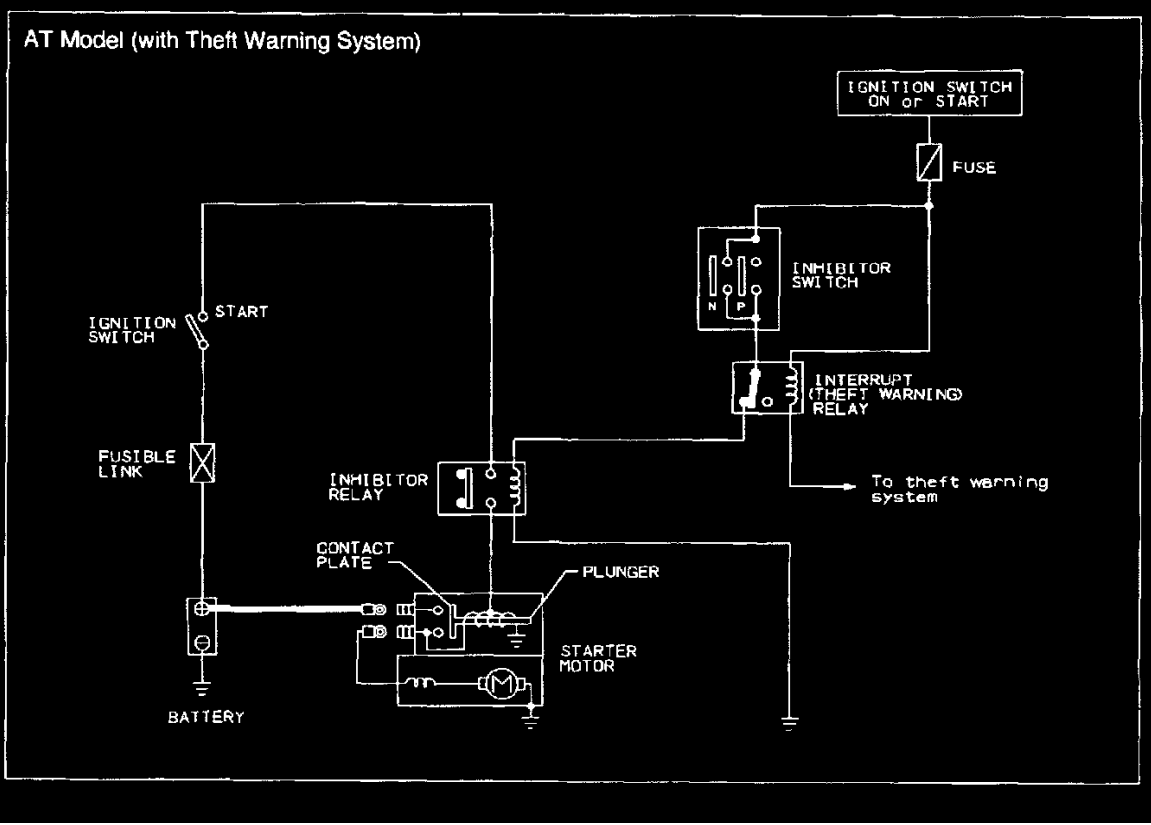
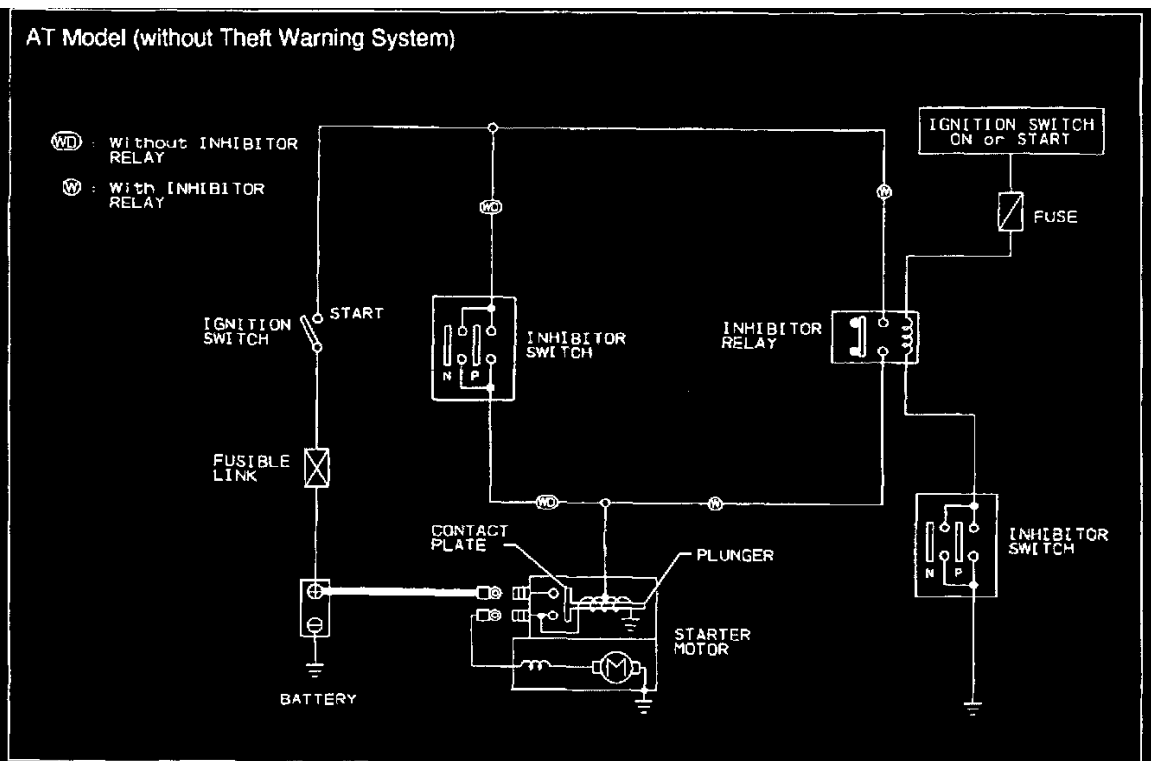
Starter Motor Operation

When the ignition switch is in the START position, battery voltage is supplied to the starter motor through the ignition switch. The plunger in the motor is pulled to the left by a magnetic force as indicated in the following diagrams, then the contact plate of the plunger allows battery voltage to be applied to the motor directly, and the starter motor rotates.

When the engine is running and the ignition switch is returned to the ON position, the magnetic force required to pull the plunger in is removed and the plunger is returned to its resting position by the return spring in the starter motor. Battery voltage is no longer applied to the starter motor and the motor stops.

Starting System Operation

AT MODEL



^ Without Theft Warning System

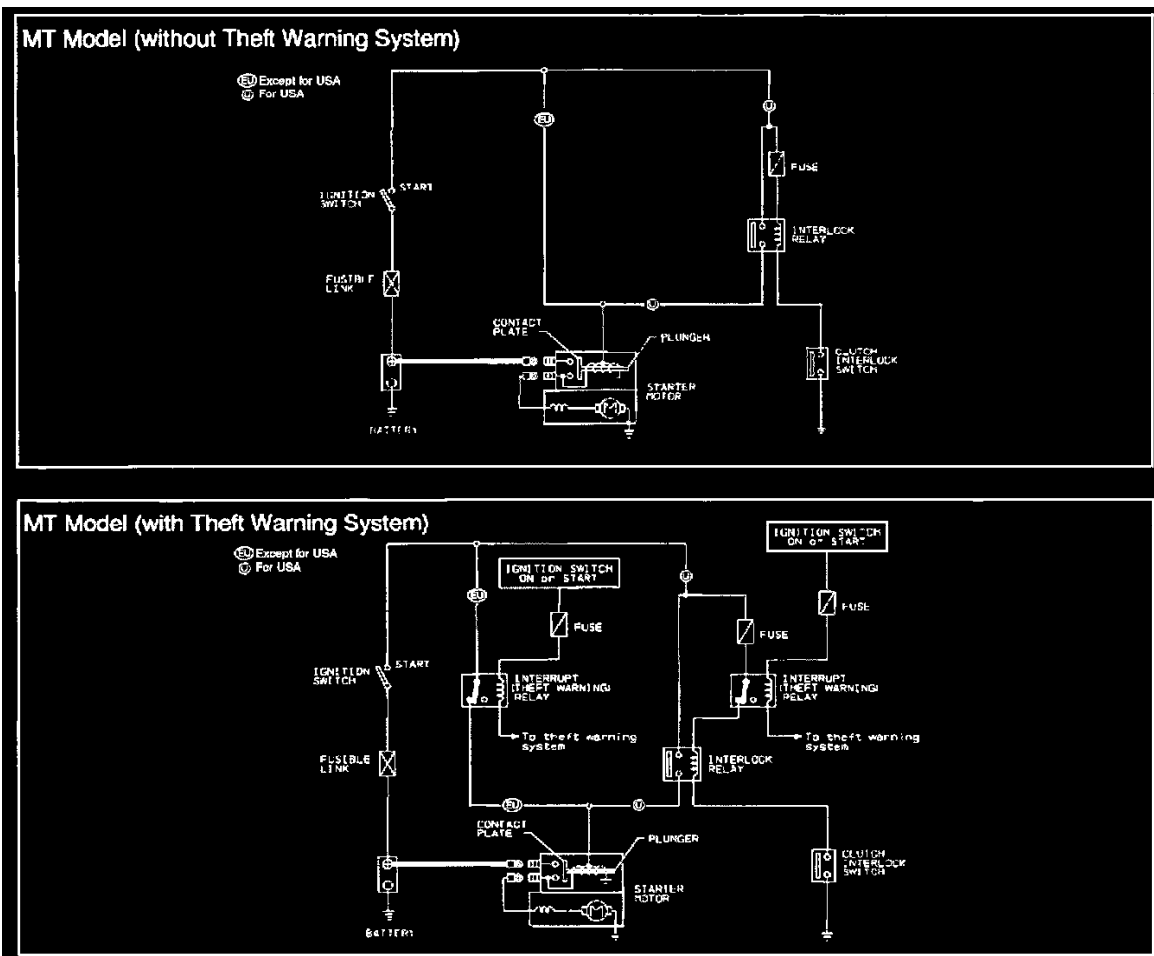
With the inhibitor switch in PARK or NEUTRAL and the ignition switch in ON or START, battery voltage is ready to be applied to the starter motor through the inhibitor relay.

^ With Theft Warning System

With the inhibitor switch in PARK or NEUTRAL and the ignition switch in ON or START, without the interrupt relay (theft warning relay) activated, battery voltage is ready to be applied to the starter motor through the inhibitor relay.

MT MODEL

For USA



- ^ Without Theft Warning System
With the clutch interlock switch in ON (clutch pedal depressed), battery voltage is ready to be applied to the starter motor through the interlock relay.
 - ^ With Theft Warning System
With the clutch interlock switch in ON (clutch pedal depressed), without the interrupt relay (theft warning relay) activated, battery voltage is ready to be applied to the starter motor through the interlock relay.
- Except for USA
- ^ Without Theft Warning System
With the ignition switch in START, battery voltage is directly applied to the starter motor.
 - ^ With Theft Warning System
Without the interrupt relay (theft warning relay) activated, battery voltage is ready to be applied to the starter motor through the interrupt relay (theft warning relay).

Checking Terminal Voltage

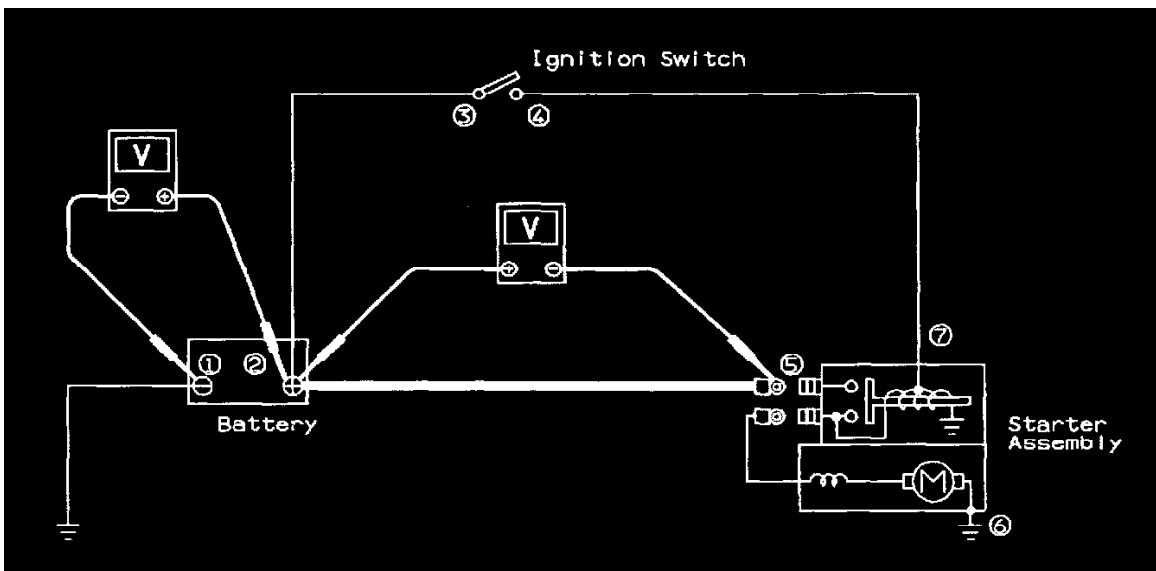
The following information contains techniques on how to perform a voltage drop test on a starter circuit. Performing a voltage drop test can aid the technician in locating and correcting starter circuit problems.

NOTE: To prevent the engine from starting during testing, remove the fuel pump fuse and bleed-off the fuel pressure from the fuel system.

Before performing the following test, visually inspect the starter, battery, cables and any other related components to ensure that the problem lies beyond a simple visual inspection.

Let the following chart serve as a diagnostic guide in troubleshooting a starting circuit.

NOTE: System voltage is 12.2 volts unless otherwise noted. Values may vary depending on ambient or engine temperature, engine condition, oil viscosity, etc.



TEST POINTS

TERMINALS	VOLTS	AMPS	CONDITION
1(-) & 2(+)	12.8	-	no load
1(-) & 2(+)	11.2	-	while cranking
Between 2 & 5	-	60.0	while cranking
2(+) & 5(-)	0.2	-	while cranking
6(+) & 1(-)	0.15	-	while cranking
2(+) & 7(-)	0.82	-	while cranking
Between 4 & 7	-	20.0	while cranking
2(+) & 3(-)	0.17	-	while cranking
3(+) & 4(-)	0.18	-	while cranking
4(+) & 7(-)	0.29	-	while cranking

(+), (-): Tester probe for voltmeter

Voltage Drop Test Chart (Example)

Charging System Operation

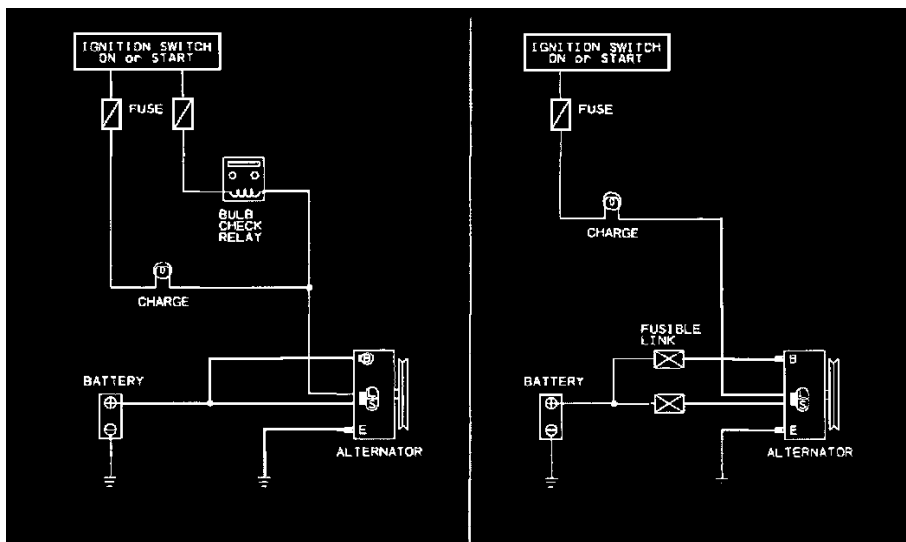
When the ignition switch is in ON or START, current from the battery flows from the L terminal to the E terminal of the alternator, causing the CHARGE lamp to light up.

Then when the engine is started, the voltage output increases as the alternator rpm increases. When the voltage output becomes greater than the battery voltage, current for recharging flows from the B terminal. Simultaneously, voltage at the L terminal disappears, causing the CHARGE lamp to go out.

Note: It is possible for the alternator to charge, with the "L" circuit in operation by accelerating the engine so the RPM's are above 3,600. The current will raise high enough to complete the field current. The alternator will continue to charge until the engine is turned off. Alternator will not charge below 3,600 RPM because the field current has not been turned on by current induced by residual magnetism.

Checking Terminal Voltage

When diagnosing the charging circuit the same precautions and test methods as used for the starting circuit should be followed. Visually checking for wires and connections that are loose, corroded, chaffed, etc. can aid in the diagnosis process.



The voltage drop method can also be used to isolate poor connections and unwanted resistance just as in the starting circuit.

TERMINALS	VOLTS	CONDITION(S)
"B" terminal of alternator (+) positive terminal of battery (-)	0.2	charging 10 amps flowing in circuit
negative terminal of battery (+) alternator frame (-)	0.2	charging
positive terminal of battery (+) "L" terminal of alternator (-)	0.2	engine off and key on *

*System voltage 12.1 volts (+), (-): Tester probe for voltmeter

Voltage Drop Test Chart (Example)
For the chart charging voltage is 14.7 volts.

Battery, Starter, Alternator Incidents By Model

1991 Truck (D21) KA24E Engine

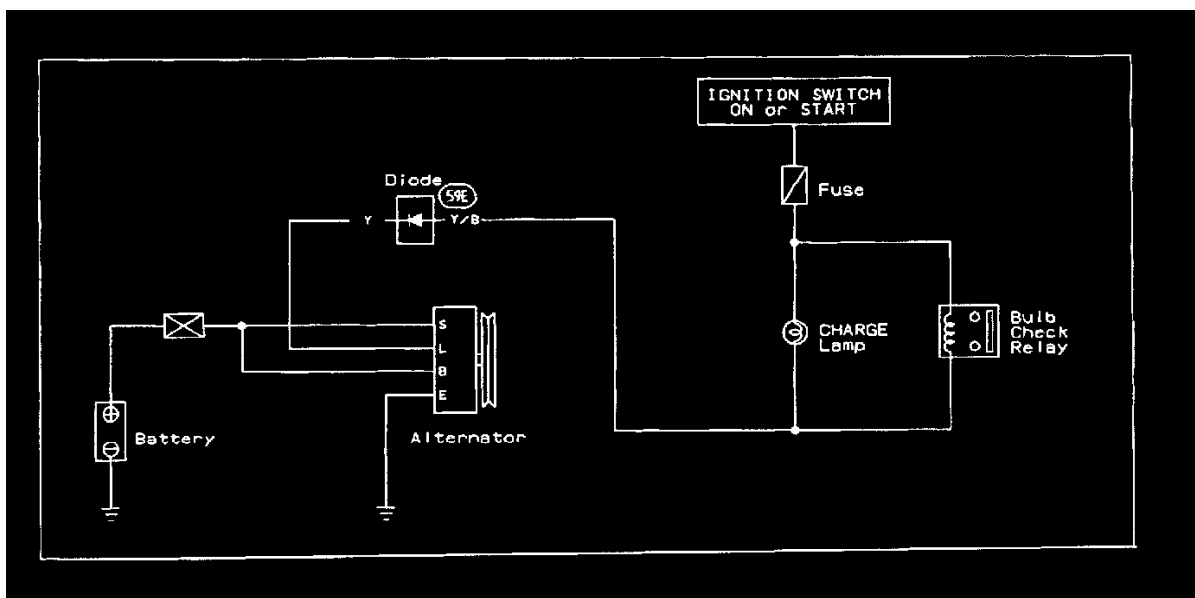
Customer Complaint: "The engine won't start. It doesn't turn over".

Dealer Verified Symptoms: Dealer verified battery was completely discharged.

Dealer Action: Dealer recharged battery. Battery failed load test. Dealer tested alternator output and found the alternator output 0.0V. Vehicle was running on battery voltage. Dealer installed a new alternator and battery.

ITEM	CONDITION	ACTION	RESULTS
Battery	Load test @ 150 amps for 15 seconds Minimum voltage 7.6 volts	Replace	No change
Alternator	Maximum output voltage at 2,000 RPM 12.1V	Replace	No change
Wire harness "Y" wire at diode 59E	Output voltage at alternator 'L' terminal was 14.1V@ 3,800 RPM. Voltage at "Y/B" wire at diode 59E was 0.0V.	Repair "Y" wire at diode 59E	Resolved

Dealer Test Procedure



Field Correction: Dealer found the "Y" wire at diode 59E broken. The wire had been installed on harness and not on diode. Dealer repaired the "Y" wire and properly secured the diode to the engine harness. With damaged harness in "L" terminal circuit, the alternator will not charge below 3,600 RPM.

1992 Maxima (J30) VE30DE Engine

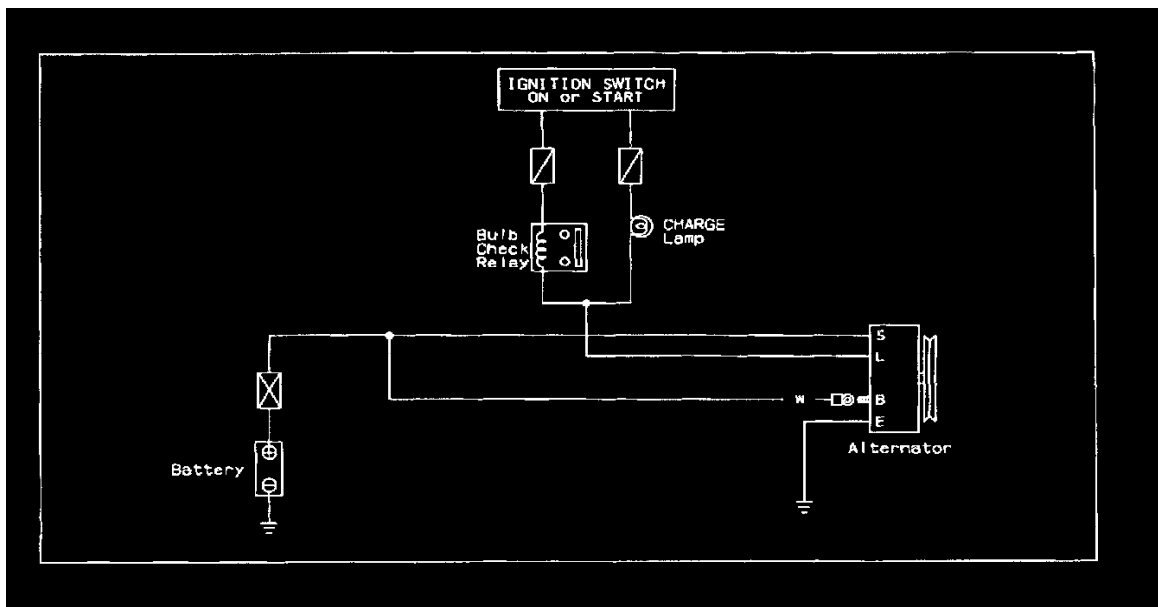
Customer Complaint: "My lights went dim. The car stalled".

Dealer Verified Symptoms: Dealer verified battery voltage was low when vehicle was towed to Dealer.

Dealer Action: Dealer found battery specific gravity to be 1.150. Dealer recharged battery. Load tested battery after recharging. Alternator output test showed alternator failure.

ITEM	CONDITION	ACTION	RESULTS
Battery	Specific gravity hydrometer test 1.150	Recharge battery	No change
Battery	Load test @ 150 amps for 15 seconds Minimum voltage 10.2V	No further action	No change
Alternator Output	Maximum output voltage at 2,000 RPM 12.5V	Alternator harness inspection	No change
Wire harness inspection	Engine "Off"	Repair damaged "W" Battery Voltage wire	Resolved

Dealer Test Procedure



Field Correction: Dealer found the "W" Battery Voltage wire connector loose and burnt. Dealer removed and replaced section of damaged wire, installed a new eyelet ring, and cleaned connection at alternator. Dealer reattached "W" wire to alternator to resolve incident.

1992 Maxima (J30) VG30E Engine

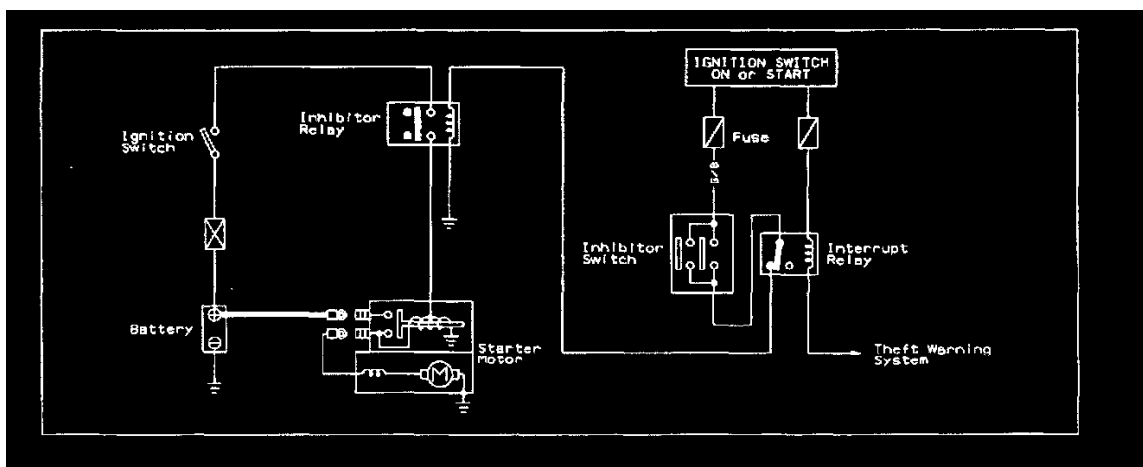
Customer Complaint: "When I back up a hill, my car won't start".

Dealer Verified Symptoms: Dealer verified engine will not crank intermittently. Dealer could duplicate incident best when parking vehicle on a slight incline.

Dealer Action: Dealer tested battery alternator, and starter. Dealer tested inhibitor switch and inhibitor relay circuit.

ITEM	CONDITION	ACTION	RESULTS
Battery	Specific gravity hydrometer test 1.240	Pass test	No change
Battery	Load test @ 150 amps for 15 seconds Minimum voltage 10.2V	Pass test	No change
Alternator Output	Maximum output voltage at 2,000 RPM 14.1V	Pass test	No change
Starter Motor Amperage draw Incident occurring	Engine "No crank"	Starter Motor had 0.0 amperage draw during incident	No change
Starter Motor Amperage draw No incident	Engine "Cranking"	Starter Motor had 110 amperage draw when "Cranking"	No change
Inhibitor switch	Engine "No crank"	Battery Voltage not supplied to inhibitor switch	No change
Wire harness inspection	Engine "No crank"	Repair damaged inhibitor switch power supply "G/B wire	Resolved

Dealer Test Procedure



Field Correction: Dealer found the "G/B" power supply wire to the inhibitor switch damaged. The EFI/Engine harness wire tie was too tight and was cutting wire. Parking vehicle on a hill put additional strain on harness creating an open circuit.

1989 Maxima (J30) VG30E Engine

Customer Complaint: "Engine would not crank".

Dealer Verified Symptoms: Dealer verified customer complaint of "Engine will not turn over".

Dealer Action: Dealer tested battery and starter. Dealer performed battery test specific gravity and load test, starter draw test with ignition switch in "Crank/Start position".

ITEM	CONDITION	ACTION	RESULTS
Battery	Specific gravity hydrometer test 1.235	Pass test	No change
Battery	Load test @ 150 amps for 15 seconds Minimum voltage 9.8V	Pass test	No change
Starter Motor Amperage draw Incident occurring	Engine "No crank" Starter Motor had 410 Amperage draw ignition switch "Crank/Start".	Replace Starter	Resolved

Dealer Test Procedure

Field Correction: Dealer found Starter Motor armature burned. Brush holders bent over from heat. Dealer installed a rebuilt Starter Motor.